	Title	Current OR
1	Ultras nic transduc r array having laser-drill d vias f r electrical connection of electrodes	367/155
2	Method of manufacturing a microactuator	29/25.35
3	Broadband phased array transducer design with frequency controlled two dimension capability and methods for manufacture thereof	600/459
4	Broadband phased array transducer design with frequency controlled two dimension capability and methods for manufacture thereof	600/459
5	Method of manufacturing piezoelectric-resonator having vibrating spaces formed therein	29/25.35
6	Method of manufacturing a piezoelectric vibrator capable of reliably preventing dielectric breakdown	29/25.35
7	Method of manufacturing a piezoelectric tuning fork resonator	29/25.35
8	Apparatus for passive damping of a structure	310/326
9	Method for encapsulating a ceramic device for embedding in composite structures	29/25.35
10	Piezo-electric transducer having electrodes that adhere well both to ceramic as well as to plastics	367/164
11	Two-dimensional piezoelectric transducer assembly	310/337

	Title	Current R
12	Laminat d piezo lectric keyb ard	341/34
13	Embedded piezoelectric structure and control	310/328
14	Dual mode transducer	310/322
15	Anti-icing and deicing device	244/134D
16	Impulse ink jet print head and method of making same	347/40
17	Polymeric piezoelectric ultrasonic probe	367/140
18	Lead structure for a piezoelectric array-type ultrasonic probe	310/334
19	Piezoelectric stress wave transducer with boron nitride piezo support	310/338
20	Device sensitive to pressure waves	73/658
21	Drag modificati n piez l ctric panels	310/316.01

	Current XRef
1	310/334; 310/336; 310/365; 310/366; 367/140
2	310/369; 427/100
3	310/334
4	310/367; 310/369
5	310/340
6	264/435; 310/357; 310/366
7	310/321; 310/370
8	310/345
9	310/340
10	310/366
11	310/334; 310/359; 310/366; 367/155; 367/180

	Current XRef
12	200/5A; 200/512; 310/339; 310/340
13	29/25.35; 310/316.01; 310/317; 310/323.21; 310/326; 310/330; 310/331; 310/339; 310/340
14	310/317; 310/324; 310/339
15	244/134F; 244/134R
16	347/70
17	310/311; 310/325; 310/334; 310/359; 310/366; 310/800
18	174/52.4; 310/335; 310/365; 361/772
19	310/327; 310/346
20	310/800
21	310/311; 310/338; 310/800; 73/861.72; 73/DIG.4

	Current XRef
22	310/322; 310/334; 381/190
23	310/326; 310/330; 310/366; 984/371; 984/DIG.1
24	310/346; 338/5; 73/DIG.4

	Title	Current OR
22	Piezo l ctric transduc r arrang ment with integral terminals and h using	310/324
23	Vibration detecting device having a piezoelectric ceramic plate and a method for adapting the same for use in musical instruments	310/323.21
24	FORCE TRANSDUCER UNITS WITH MULTIPLE SENSING ELEMENTS	310/328

US-PAT-NO: **5687462**

DOCUMENT-IDENTIFIER: US 5687462 A

TITLE: Packaged strain actuator

DATE-ISSUED: November 18, 1997

INVENTOR-INFORMATION:

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Lundstrom; Mark E.	Cambridge	MA	N/A	N/A
Moore; Jeffrey W.	Concord	MA	N/A	N/A
Crawley; Edward F.	Cambridge	MA	N/A	N/A

US-CL-CURRENT: **29/25.35**, **29/830** , **29/841** , 310/330 , 310/331 , 310/366

ABSTRACT:

A modular **actuator assembly** includes one or more plates or elements of electro-active material bonded to an electroded sheet, preferably by a structural polymer to form a card. The card is sealed, and may itself constitute a practical device, such as a vane, shaker, stirrer, lever, pusher or sonicator for direct contact with a solid or immersion in a fluid, or may be bonded by a stiff adhesive to make a surface-to-surface mechanical coupling with a solid workpiece,device, substrate machine or sample. The structural polymer provides a bending stiffness such that the thin plate does not deform to its breaking point, and a mechanical stiffness such that shear forces are efficiently coupled from the plate to the workpiece. In further embodiments,

the card may include active circuit elements for switching, powering or processing signals, and/or passive circuit elements for filtering, matching or damping signals, so that few or no connections to outside circuitry are required. The **actuator assembly** can be manufactured in quantity, to provide a versatile actuator with uniform mechanical and actuation characteristics, that introduces negligible mass loading to the workpiece. The cards themselves may be arranged as independent mechanical actuators, rather than strain-transfer actuators, in which the induced strain changes the position of the card. Various arrangements of pinned or cantilevered cards may act as a pusher, bender or other motive actuator, and structures such as powered bellows may be formed directly by folding one or more suitably patterned cards.

8 Claims, 32 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 9

L Number	Hits	Search Text	DB	Time stamp
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-	0	"vibration control system". and 29/$.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/25 09:12
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-	0	"vibration control system" and substrate and sensor and circuit adj element	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/24 13:14
-	10	"vibration control system" and sensor and circuit adj element	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/24 13:16
-	165	"vibration control system" and sensor and circuit	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/24 13:16
-	1	2000-506017.NRAN.	DERWENT	2003/09/24 13:26

-	2	actuator adj assembly and PZT and conductor and active adj element and 29/$.ccls.	USPAT; US-P PUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/25 08:14
-	24	("3582691" | "4054808" | "4240002" | "4363991" | "4461179" | "4578611" | "4611141" | "4651310" | "4680595" | "4732351" | "4761582" | "4849668" | "4857887" | "4864179" | "4914565" | "5305507" | "5315203" | "5341550" | "5400488" | "5410789" | "5415175" | "5438998" | "5454146" | "5493541").PN.	USPAT	2003/09/24 15:34
-	5	("3071841" | "3175107" | "4376302" | "4692652" | "4780639").PN.	USPAT	2003/09/24 15:36
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-	9	"vibration control system" and lens adj assembly	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/25 08:08
-	0	20030040818.URPN.	USPAT	2003/09/25 08:10
-	5	("3071841" | "3175107" | "4376302" | "4692652" | "4780639").PN.	USPAT	2003/09/25 08:13
-	24	("3582691" | "4054808" | "4240002" | "4363991" | "4461179" | "4578611" | "4611141" | "4651310" | "4680595" | "4732351" | "4761582" | "4849668" | "4857887" | "4864179" | "4914565" | "5305507" | "5315203" | "5341550" | "5400488" | "5410789" | "5415175" | "5438998" | "5454146" | "5493541").PN.	USPAT	2003/09/25 08:15
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-	2	4651310.pn.	USPAT; US-PGPUB; EP ; JP ; DERWENT; IBM_TDB	2003/09/25 08:39

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-	0	"vibration control system" and Sprangler .inv.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/25 09:12
-	3	Sprangler .inv.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/25 09:14
-	0	Ronald near Sprangler .inv.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/25 09:14